Original scientific paper

UDC: 316.644-057.874:51

Received: March 14, 2024.
Revised: July 13, 2024.
Accepted: August 07, 2024.

10.23947/2334-8496-2024-12-2-283-293

Check for updates

Pupils' Avoidance Strategies in Mathematics and Their Perception of the Teachers' Performance and Mastery

Danijela Milošević[1*], *Nevena Trifunović*[2], *Bisera Jevtić*[1]

[1] University of Niš, Faculty of Philosophy, Department of pedagogy, Serbia,
e-mail: danijela.milosevic@filfak.ni.ac.rs; bisera.jevtic@filfak.ni.ac.rs
[2] Academy of educational medical vocational studies in Kruševac, Serbia, e-mail: stanisavljevicnevena@gmail.com

Abstract: The aim of this research was to examine the attitudes of pupils about avoidance strategies in mathematics and their perception of the way mathematics teachers work. The research was conducted in the Republic of Serbia on a sample of 1165 primary school pupils. A quantitative approach was applied with a standardized instrument made up of five subscales which examined three avoidance strategies (novelty avoidance, providing assistance and self-handicapping) and two categories which include the style and method of the teacher's work (targeted structured teaching and mastery). The results have shown that pupils are mostly inclined towards the novelty avoidance strategy. The research has also revealed some differences when it comes to pupils' attitudes about avoidance strategies and their perception of the teacher's approach in relation to their success at school and grade levels in mathematics. It was shown that the school location was a significant independent variable in determining the differences in pupils' perceptions of the mastery of the teacher. It can be concluded that good didactic methodical organization of teaching, continuous monitoring of pupil progress, the teacher's pedagogical approach, developing pupils' skills in overcoming learning difficulties and monitoring their own work are some of the primary prerequisites for overcoming avoidance strategies and improving the educational work of teachers.

Keywords: *avoidance strategies, mastery learning, mathematics education, student attitudes and perceptions, teaching styles.*

Introduction

Mathematics education is a field of research which has been examined for decades with regard to the pedagogical context, teaching and learning. In the 21st century mathematics has had a special significance since it influences the process of logical and systematic thinking and enables the acquisition of skills for constructive problem solving (Dewanti, Kartowagiran, and Jailani, 2020). Mathematics education contributes to the readiness of young people to live in the modern world since a certain level of mathematical knowledge, mathematical reasoning and the use of the tools prepare students for a better understanding and problem solving out of school (Pavlović-Babić and Baucal, 2012).

In the basic system of education and upbringing of the Republic of Serbia, mathematics still represents a school subject which requires everyday, systematic and continuous work. The results of the International Student Assessment (PISA) show that more than a third of the pupils in Serbia have mathematical achievements below the basic level, which is significantly higher than the OECD average (Videnović and Čaprić, 2020). Lack of mathematical knowledge and skills makes the process of learning more difficult. There is a fear and student workload (Wang, 2021), which thus affects their further progress. The research has shown that lack of prior knowledge, a low level of students' attention and interest are becoming increasingly common in teaching mathematics. On the other hand, it has been found that teachers do not apply student-centered methods and they also lack teaching management skills (Baran, 2019).

To what extent anticipated student goals will be achieved depends on their abilities, understand-

*Corresponding author: danijela.milosevic@filfak.ni.ac.rs

ing instructions, the level of perserverance in solving the task and the quality of teaching. Students who show greater engagement in learning, have clear personal goals and the motivation to learn. They also have a greater ability to endure the challenges they encounter while mastering the knowledge of mathematics. They express a greater sense of belonging to the environment in which they study due to their self-efficacy and self-confidence. They also have positive feelings towards mathematics, they accept the opportunities that mathematics provides and they are inspired to use mathematical skills in everyday life. On the other hand, students who have a negative attitude towards mathematics are not motivated to study, and often show resistance when it comes to acquiring new mathematical knowledge (Willis, 2010). Students who do not desire to acquire new mathematical knowledge, resort to using different avoidance strategies which make it difficult for them to master the content and also negatively affect their mathematical achievements. Students prone to avoid mathematics do not want to ask their teachers or peers for help because they want to hide their own lack of ability, that is, not understanding mathematical content (Ramirez et al., 2018). They feel less efficient at work and they refuse to ask for help due to the feeling of fear that they will show themselves as less capable or successful in front of others (Klinger, 2011). For the same reason, students are often prone to use the self-handicapping strategy, which refers to the way of regulating a threat that undermines their self-esteem. This strategy is manifested by the student procrastinating in solving the task and finding reasons not to invest any effort in solving it (Schwinger et al., 2014). The third type of avoidance strategy includes resistance to novel approaches to solving problems (Turner et al., 2002). Students, due to their fear of making a mistake, often avoid new ways of problem-solving or learning new teaching content. Closedness to novelty prevents the student from making progress and improving their skills and experiences (Pan et al., 2020).

The application of avoidance strategies in mathematics is conditioned by the quality of teaching and the way teachers work. How the students will interpret the content and in what time they will master it greatly depends on the quality of teaching, that is, OF (from) the teacher. While the application of inadequate learning methods contributes to the bad mathematical performance of students (Geary, 2011), effective methods used by the teacher in working with students have a long-term effect on students' achievement (Munawaroh, 2017), but also on their interest and emotional well-being (Davadas, and Lay, 2018). If the teaching process is performed at a low level, students might develop various learning difficulties, which also affects their academic achievements (Uysal, 2015). Research has shown that the quality of teaching is reflected in the way students experience the goal structure in the classroom and the way they perceive the mastery of the teacher. It has been proven that the mentioned avoidance strategies are related to the low level of mastery and that the use of these strategies greatly depends on the motivational and affective support of teachers (Turner et al., 2002). Other research has found that the goal structure focused on classroom performance is related to students' personal goals. Those students value the idea of learning and show a greater level of self-efficacy, i.e. they show greater motivation and perseverance in work. On the other hand, when it comes to mastery, the teacher realizes activities which develop students' competences, that is they strive for their personal development (Fokkens-Bruinsma, Van Rooij, and Canrinus, 2020). The results of the research have shown that pupils' perception of mastery is positively related to their emotional and cognitive engagement (Uçar and Sungur, 2017).

Bearing in mind the presented results, as well as the fact that learning math is an interactive and dynamic process that requires long-term work, some of the most common problems in students' approach to mathematics are negative attitudes about mathematics, fear of failure, low level of persistence in solving tasks, lack of motivation of students in mastering the teaching content in mathematics, lack of peer cooperation in mastering mathematical knowledge, inadequate relationship between students and the teacher, etc. When it comes to the approach of mathematics teachers, problems arise, such as insufficient didactic-methodical competence of mathematics teachers, unrealistic expectations about achieving results from students, and lack of motivation to work and provide assistance to students in mastering the teaching content. The mentioned problems affect the formation of students' negative attitudes towards mathematics and the use of avoidance strategies, which indicates the need for new scientific knowledge obtained from this work.

Starting from the fact that pupils are primary users of the school program which regulates all the content, processes and activities aimed at achieving principles, goals and the standard of achievement, the research examined their attitudes about avoidance strategies in mathematics and their perception of the way mathematics teachers work, as a key factor in improving the teaching process.

Materials and Methods

Research Questions, Research Aim and Research Tasks

The starting point were the following research questions: 1) Which avoidance strategies in mathematics are the pupils most inclined to? and 2) Can school success, grades in math and the school location influence pupils' perception of avoidance strategies in mathematics and the way mathematics teachers work?

The aim of the research was to examine pupils' attitudes about avoidance strategies in mathematics and their perception of the style and methods mathematics teachers use in their work. There is very little research dealing with student strategies of avoiding mathematics, especially in the Republic of Serbia. For this reason, the research was conducted with the intention of providing new findings and pedagogical implications for the improvement of educational practice. The research started with the following tasks:

1. Determine the orientation of pupils towards avoidance strategies in mathematics.
2. Examine pupils' attitudes about avoidance strategies in mathematics (novelty strategies, help seeking and self-handicapping) with regard to independent variables (school success and grade level in mathematics).
3. Examine pupils' perceptions of the way mathematics teachers work (targeted structured teaching and mastery) with regard to independent variables (school success, grade level in mathematics and school location).

The research was based on the assumption that students will show the greatest inclination towards strategies for avoiding novelties, as well as that, about all three variables, students' answers will differ based on mathematics grade, school success, and school location.

Sample

In the Republic of Serbia, primary education is obligatory and it is comprised of two levels, each of them lasting 4 years. The first cycle is from the 1st to the 4th grade and it comprises children aged 7-10. The second cycle is from the 5th to the 8th grade and it is attended by pupils aged 11-14. Secondary education comprises only one level lasting four years. High school students are aged from 15 to 18.

The total sample of the research includes 1165 primary school pupils, from the second cycle (5th – 8th grade) on the territory of the Republic of Serbia. Out of 1165 pupils, 275 (23.6%) are from rural schools and 890 (76.4%) from urban schools. Taking into account the data on the total number of the children enrolled in the second cycle in primary schools of the Republic of Serbia for 2020/2021 school year (https://bit.ly/3brdLDq) and the total sample of this research, the sample size fully meets the 95% confidence interval.

Research Instruments and Procedures

Five sub-scales were used in the research. A scale to avoid help seeking, developed by Ryan, was used here (Ryan, Gheen, and Midgley, 1998), all the other scales were taken from the Patterns of Adaptive Learning Survey (Midgley, Kaplan, and Middleton, 2001). The pupils responded to the items on the scale from 1 (not at all true) to 5 (very true). The validity of the subscales is shown in Table 1.

Table 1. *Reliability of instrument sub-scales*

Sub-scales	Cronbach α
Avoiding novelty	.84
Avoiding help seeking	.81
Self-handicapping strategies	.82
Classroom performance	.82
Classroom mastery	.75

There are three scales in the survey concerning avoidance strategies and two scales assessing

pupils' perceptions of the mastery and performance goal structure. All the subscales turned out to be reliable and valid, which is confirmed by the Cronbach α value of internal consistency, which ranges from .75 to .84.

In conducting the research, all ethical standards were respected. Firstly, the school principals were contacted and with their approval cooperation with the pedagogists was established. After a detailed examination of the instrument, the pedagogists confirmed the linguistic adequacy of the claims in it, namely, that the claims do not violate children's dignity in any way. Considering that minors were examined, the parents were informed about the aim and way of conducting the research in collaboration with the pedagogists and teachers. With their consent, the pupils completed the assessment scale and were given the opportunity to give up at any time. Completing the instrument lasted for 15 minutes. The pupils and schools participating in the research were guaranteed complete anonymity.

Data Analysis

The arithmetic mean (M), as one of the measures of the central tendency, and the standard deviation (SD), as one of the dispersion measures that measured the deviation from the average were used for the purpose of this research. The analysis of variance (ANOVA) was also used to determine the differences between the variables, Post hoc analysis to determine the differences between groups and a t-test to determine the differences between the independent samples. The statistical analysis was done in the software SPSS.25.

Results

In order to determine the differences in pupils' attitudes about avoidance strategies in mathematics and the style and method of the teacher's work in relation to the independent variables, t-test and the analysis of variance (ANOVA) were applied. Avoidance strategies that primary school students resort to in their math classes were established first (Table 2).

Table 2. *Pupils' attitudes about avoidance strategies in mathematics*

Strategies	N	M	SD
Avoiding novelty	1165	3.21	1.08
Avoiding help seeking	1165	2.44	1.02
Self-handicapping	1165	2.03	1.01

The results indicate that the pupils are mostly oriented towards the novelty avoidance strategy (M=3.21, SD=1.08), then help seeking (M=2.44, SD=1.02), and they are least oriented towards the self-handicapping strategy (M=2.03, SD=1.01).

The differences in the pupils' attitudes about avoiding novelty, avoiding help seeking and self-handicapping strategies in mathematics teaching with regard to school success are shown in Table 3. For this purpose, the Post hoc test was conducted.

Table 3. *Post hoc analysis the pupils' attitudes about avoidance strategies in mathematics and school success*

Strategies	Academic performance		Mean difference	SE	p
Avoiding Novelty	Excellent	Insufficient	-2.64345	1.56162	.908
		Sufficient	2.68988	3.10393	1.000
		Good	-1.92287*	.68071	.048
		Very good	-1.92093*	.34520	.000
Avoiding Help Seeking	Excellent	Insufficient	-2.60446	1.46641	.760
		Sufficient	-.60446	2.91468	1.000
		Good	-2.81034*	.63921	.000
		Very good	-1.98907*	.32415	.000
Self-Handicapping	Excellent	Insufficient	-2.11119	1.45343	1.000
		Sufficient	-.19452	2.88889	1.000
		Good	-2.79256*	.63355	.000
		Very good	-1.72840*	.32128	.000

**The mean difference is significant at the .05 level*

Table 3 shows that statistically significant differences (p<.05) were found in the pupils' answers about avoidance strategies in mathematics relative to their school success. More precisely, some differences were found between individual groups (excellent success in regard to good and very good) in relation to pupils' attitudes about avoiding novelty, avoiding help-seeking and self-handicapping strategies. It was determined that the pupils with good and very good school success would rather choose mathematical problems that they know how to solve than those they had never solved before. On the other hand, it turned out that the pupils with excellent success were more open to acquiring new mathematical knowledge. In regard to help-seeking, while solving mathematical problems, its confirmed statistically significant differences between the group of pupils with excellent success in regard to groups of students with good and very good success. The pupils with good and very good school success significantly rather than the pupils with excellent school success find reasons for insufficient orientation towards solving mathematical problems. Generally speaking, the results obtained suggest that pupils with excellent school success are aimed at acquiring new knowledge, but they ask for help less than others. The pupils with bad school success did not show openness to learning new content in mathematics, and they also had a greater need to use the self-handicapping strategy.

The Post hoc analysis was used to determine which groups of students, in relation to their grade in mathematics, there are significant differences in attitudes about avoidance strategies in mathematics (Table 4).

Table 4. *Post hoc analysis the pupils' attitudes about avoidance strategies in mathematics based on the final grade*

Strategies	Math grade**		Mean difference	SE	p
Avoiding Novelty	2	1	1.96611	.95361	.395
		3	1.21483	.49588	.144
		4	2.47327*	.47943	.000
		5	4.27990*	.44768	.000
Avoiding Help Seeking	2	1	1.29440	.89865	1.000
		3	1.35510*	.46730	.038
		4	2.79384*	.45180	.000
		5	4.13725*	.42188	.000
Self-Handicapping	2	1	2.34314	.89644	.091
		3	1.05683	.46615	.236
		4	2.50328*	.45069	.000
		5	3.61294*	.42084	.000

**The mean difference is significant at the .05 level*

***Math grade in previous semester - The student's marks in each subject are averaged at the end of every semester and final grades are determined by the following ranges: 5 (excellent), 4 (very good), 3 (good), 2 (sufficient) is the lowest passing grade, 1 (insufficient) is the lowest possible grade, and the failing one*

Significant differences in the answers were determined among pupils with different grades in mathematics in the categories of avoiding novelty (F=27.141, df=4, p=.000), avoiding help-seeking (F=28.423, df=4, p=.000) and self-handicapping strategies (F=22.201, df=4, p=.000). Applying post hoc analysis (Table 4) showed that in all three categories, the pupils with a lower math grade (2-sufficient) showed lower orientation towards the desire to acquire new -mathematical knowledge, with a tendency to avoid help-seeking and to find excuses for their failures in solving mathematical problems. On the other hand, the pupils with higher grades (4 and 5) showed negative attitudes toward avoiding strategies which indicate that those groups of pupils are oriented toward achieving success in mathematics.

Considering that the pupils showed different attitudes about avoidance strategies in mathematics, the research also determined their perceptions of the way mathematics teachers work. For this purpose, the analysis of variance (ANOVA) and Post hoc analysis was used to explore differences between groups.

Table 5. *Post hoc analysis the pupils' attitudes about the way mathematics teachers work relative to their school success*

	Academic performance		Mean difference	SE	p
Classroom performance	Insufficient	Sufficient	-3.25000	3.35346	1.000
		Good	-4.93137*	1.62667	.025
		Very good	-4.28205	1.52423	.050
		Excellent	-3.85260	1.51219	.110
Classroom mastery	Insufficient	Sufficient	-8.25000	3.85216	.324
		Good	-7.67647*	1.86857	.000
		Very good	-7.03571*	1.75090	.001
		Excellent	-6.70404*	1.73707	.001

**The mean difference is significant at the .05 level.*

Significant differences were identified in the attitudes of pupils of different school success about perceived classroom performance-focused goal structure (F=2.752, df=4, p=.027) and perceived classroom mastery-focused goal structure of mathematics teachers (F=4.494, df=4, p=.001). The results in Table 5 show that the pupils with good school success had a statistically significant positive attitude about classroom performance in comparison with pupils with insufficient success. This implies that students with good success positively value giving feedback to the teacher and their promptness in informing the pupils about their achievements. When it comes to perceiving classroom mastery, the pupils with good, very good and excellent school success have significantly positive attitudes in comparison with a group of insufficient success pupils.

Table 6 shows the Post hoc results and between groups confirms significant differences in the pupils' perception of the way the teacher works.

Table 6. *Post hoc analysis the pupils' perceptions of the way the teacher works relative to their final math grade*

	Math grade		Mean difference	*SE*	*p*
Classroom performance	2	1	-2.07843	1.08330	.553
		3	-3.54357*	1.07105	.010
		4	-3.63345*	1.06134	.006
		5	-4.54455*	1.04329	.000
Classroom mastery	2	1	2.07843	1.08330	.553
		3	-1.46514	.56332	.094
		4	-1.55502*	.54463	.044
		5	-2.46612*	.50856	.000

**The mean difference is significant at the .05 level*

Results of the ANOVA indicate that there are differences in the pupils' perceptions relative to the level of their grades in mathematics, when it comes to mastery (F=9.159, df=4, p=.000) and goal structures in class (F=2.947, df=4, p=.019). Post hoc analysis presented in Table 6 implies that the pupils with higher grades in mathematics (4 and 5), in comparison with pupils with lower grades (2), have statistically significantly positivily attitudes toward teachers' strategies oriented to classroom performance and classroom mastery. Generally, the pupils with the higher grade (4 and 5) evaluated the teacher's work more positively, they claimed to be more encouraged by the teacher to look for new or unusual ways when dealing with mathematical problems, and to give them feedback about achievement in mathematics.

Table 7 shows the differences in the pupils' perceptions of the style and way the teacher works relative to the location of the school they attend. A t-test was used for this purpose.

Table 7. *t-test results for the difference between the pupils' perceptions about the way mathematics teachers work relative to the school location*

	School location	M	SD	t	df	p
Classroom performance	Rural	3.31	.99	1.719	1163	.086
	Urban	3.18	1.05			
Classroom mastery	Rural	4.05	.88	2.613	525.854	.009
	Urban	3.88	1.03			

There are significant differences in the pupils' perceptions when it comes to the category of perceived classroom mastery-focused (t=2.613, df=525.854, p=.009). The pupils attending a rural school assessed the teacher's work more positively than the pupils from urban schools. Therefore, the pupils from rural schools estimated that their mathematics teachers encouraged the desire to acquire knowledge and the teachers' methods positively influenced them to show greater interest in understanding mathematics. There were no differences in their perceptions relative to the school location in terms of student goal structure.

Discussions

A significant result found in this research indicates that primary school pupils in the Republic of Serbia show supporting attitudes towards the use of novelty avoidance strategies in mathematics. Research based on a sample of Latvian and Lithuanian students confirmed that the students showed little interest in learning mathematical content (Cēdere et al., 2015). Another study had the same results, except that it discovered that the reasons for obtaining such results stem from a lack of enthusiasm and student self-initiative to explore mathematics. There was a conclusion that the students were afraid of the difficulties they encountered while solving mathematical problems (Cēdere, Jurgena, and Targamadze, 2018). Another study proved the opposite, namely, it was found that primary school pupils used self-handicapping strategies the most and novelty avoidance the least (Turner et al., 2002). Taking into account the results obtained in this and other research, it can be concluded that pupils lack perseverance, willingness to learn and work, which encourages them to use different avoidance strategies in mathematics. Pupils are willing to acquire new knowledge when the content they are learning is related to their interests, experiences and when it has the function of preparing them for real life. It has been shown that the level of motivation and interest depends on the pupil's affective attitude towards mathematics, which also affects the quality of student achievement (Antonijević, 2012). It is known that mathematics is a school subject which requires higher levels of logical reasoning, therefore the teacher's approach is extremely important when it comes to mastering the content properly. Motivation to learn largely depends on the teacher's approach and their methodological skills, and thus resorting to the mentioned strategies. Teachers face new challenges that oblige them to make teaching material interesting, changeable and innovative.

This research has found differences in pupils' attitudes about the help avoidance strategy in relation to school success. It has turned out that pupils with medium school success are most oriented towards the help avoiding strategy. The results have shown that pupils with a high level of achievement, self-confidence and belief in their own abilities frequently asked for additional resources and participated in discussions with teachers and other pupils for better understanding and clarifying the teaching content (Akilli and Genç, 2017). Other research has shown that students who are prone to seeking help from teachers or peers have greater achievements in mathematics throughout the school year. Pupils who positively assessed the teacher's emotional support showed orientation towards seeking help (Schenke et al., 2015). Recent research has confirmed that quality social relations are crucial for creating the feelings of security and freedom. Due to efficient relationships, students do not feel any discomfort and feel free to seek help from others (Peeters, Robinson, and Rubie-Davies, 2020). Therefore, students' perceptions of the emotional support from teachers and peers greatly determine the decision to seek help. Students have the need to belong, they want their needs, desires and interests to be respected and accepted. If the teacher creates positive relationships and cares for student needs, students are likely to show greater motivation to learn, and thus they will feel more confident and free to ask for help. This finding has great pedagogical significance because it highlights the importance of a proper approach to working with students and the development of positive social relations within the department. It also emphasizes the importance of cooperation among students in the process of adopting teaching content, which can contribute to better learning results. However, teachers must develop interpersonal, socioemotional and pedagogical competencies in order to achieve the above. As Simonović (2021) concluded, in accordance with new modern requirements, teachers must develop a new profile based on various competencies.

One of the obtained results in this research is that the pupils with bad school success showed a greater need to use the self-handicapping strategy. The results of another study confirm the results obtained, which proves that the application of the self-handicapping strategy is positively related to pupils' motivation (Akin, Abaci, and Akin, 2011). The results obtained are in accordance with the expectations be-

cause they confirm that the level of perseverance, motivation and engagement in the task is much lower with pupils who have bad school success than with those who achieve better school success. The pupils who often used the self-handicapping strategy showed a lower level of clarity of self-perception, lower academic self-efficacy, they felt a higher level of anxiety while completing the test, they used superficial learning strategies and achieved lower academic results (Gadbois and Sturgeon, 2011). The results of the research have shown that the pupils who perceived mastery in a positive way used self-handicapping, help-seeking and novelty avoidance strategies less frequently (Turner et al., 2002). One of the emerging solutions is nurturing the goals of a masterful approach since it is one of the ways to reduce the level of implementing these strategies (Schwinger et al., 2014). The task of a mathematics teacher is to use the feeling of frustration that makes the pupil give up for developing constructive strategies to solve the problem in an efficient way (Goldin, 2010). Taking into account that research has shown that it is more difficult to establish emotional control and management of unpleasant emotions in younger students (Di Leo, 2019), the pedagogical challenge before teachers is how to recognize the first signs of negative emotional reactions in order to avoid a negative impact on student results. As research has shown that students with lower academic performance and worse grades in mathematics more often use self-handicapping strategies, it is necessary for teachers to devise strategies that would help students overcome the fear of failure and provide them with additional support in mastering mathematical knowledge. This finding is of great importance because it emphasizes the emotional aspect of achieving positive educational outcomes, as well as the importance of an individualized approach in teaching. By implementing these aspects, it is possible to reduce student frustration and increase motivation for learning mathematics.

When it comes to the results concerning pupils' perceptions about the way teachers work, three key findings have been discovered. The first confirms the differences in the pupils' responses about the teacher's performance and mastery goal structure, relative to the pupils' school succes. An interesting fact is that the pupils with medium school succes assessed the category of performance-focused and mastery-focused goal structure most positively. The reasons for obtaining such results stem from the fact that the teacher's approach is not crucial to pupils with better school success because they have already built self-confidence, intrinsic motivation and work habits. On the other hand, emotional support from teachers is very important to pupils with bad school success for their perseverance and motivation to work, therefore they recognize it and expect it from the teacher more often. Another result obtained is that the pupils had different perceptions of the teacher's mastery in relation to the grade level in mathematics. The pupils with the highest grade assessed the students' goal structure and mastery in class more positively than the pupils with lower grades. The results indicate that mathematics teachers are more oriented towards pupils who achieve higher grades in mathematics than towards those who achieve lower succes in mathematics. The pupils' perceptions indicate their dissatisfaction with the approach mathematics teachers use. One of the reasons for such an approach could be weak interest in learning, slow student progress and, as it was previously proven, orientation towards avoidance strategies. Nevertheless, the teacher is expected to provide the greatest emotional support, motivate them, praise them and come up with a way of making mathematics more interesting and simple to learn. This finding is of extreme importance because it indicates the need for changes in teaching practice that include identifying students with lower academic achievement who manifest anxiety towards mathematics, developing and implementing interventions to reduce anxiety, as well as encouraging the reflective practice of mathematics teachers. Such an approach could contribute to the improvement of mathematical achievements and the development of positive attitudes towards mathematics in further education.

The third result confirms that the pupils attending rural schools assessed the mastery of math teachers in the classroom more positively than those attending urban schools. The reason for obtaining such a result lies in the fact that in the Republic of Serbia, the number of pupils in rural and urban school classes differs a lot. The average number of children in a urban school class is about 24 pupils, whereas there are only a few pupils in rural school classes, who are mostly in different grades (the so-called combined classes). Consequently, the dynamics of the class and the working atmosphere differ to a great extent. Teachers in rural schools have more time available. For this reason, they can establish a stronger bond and emotional support with their pupils, and that is why the pupils attending rural schools assessed the teacher's mastery more positively. In favour of this claim, there is research conducted in Serbia which showed that the school climate was related to demographic variables, namely that a more favourable school climate was established in smaller places, where schools had a significantly smaller number of

pupils (Vujačić, Đević, and Jošić, 2020). This result once again confirms that a positive climate in the classroom has statistically significant and positive effects on self-efficacy and student engagement (Vidić, 2021), which indicates the importance of teachers in creating a stimulating atmosphere for learning.

Therefore, the general results indicate that students with lower academic performance and worse grades in mathematics often use avoidance strategies, while the teacher's approach significantly affects their interest, enjoyment of learning and the formation of attitudes towards the subject. We should bear in mind recent research results that have shown that teachers' approaches differ in terms of whether they teach natural or social science. It has been proven that science teachers were more oriented towards the approach which implied a traditional way of work (giving a lecture and asking questions), whereas social science teachers used a student-centered approach, which encouraged the students to solve problems and make decisions on a daily basis (Teppo, Soobard, and Rannikmäe, 2021). Accordingly, the importance of applying innovative teaching models is evident because they provide the possibility of active student participation, which contributes to the creation of favorable conditions for learning and work, and thus reduces the possibility of using avoidance strategies.

Based on the previous, but also the obtained research findings a significant contribution would be to establish the connection between the use of the teacher's work methods and students' avoidance strategies, as well as to investigate students' avoidance strategies, perceptions of performance-focused and mastery-focused goal structures in social science and compare it to the results of this research. In the context of the examined categories, the research could improve the findings which include examining the link between performance and mastery goal structures and students' orientation towards avoidance strategies in mathematics.

Conclusions

The research examined pupils' attitudes about avoidance strategies in mathematics and their perceptions of the way mathematics teachers work. The results show that the pupils are mostly oriented towards the novelty avoidance strategy, which indicates their lack of motivation to acquire new mathematical knowledge. The second result of this research shows that the pupils with bad school success and lower grades in mathematics are the most resorted to avoidance strategies.

The third result confirms differences in the pupils' perceptions of the teachers' performance-focused and mastery-focused goal structures in relation to their school success and grade level in mathematics. The final result revealed differences in the pupils' perceptions of the teachers' mastery in relation to whether they attend a city or a rural school. Considering that the pupils with bad school success and lower grades in mathematics were more inclined to avoidance strategies, it can be concluded that they need the greatest support and assistance in learning.

Taking into account the obtained results, it can be concluded that teaching students how to learn, showing understanding and providing help when they face learning difficulties, as well as learning how to apply acquired knowledge and skills in their daily life should be one of the priority goals of modern of mathematics education in the 21st century.

Implications

Starting from the fact that the use of pupils' avoidance strategies in mathematics stems from their fear of mistake and failure when solving tasks, it is suggested to develop pupils' intrinsic motivation and implement the strategy of learning from mistake, in order to accept novelty in mathematics. To enhance help seeking, it is important to nurture the pedagogical approach and quality relationships in the classroom and introduce active methods of teaching. To reduce the self-handicapping strategy, it is important to develop self-confidence, self-management skills, self-regulation, and personal responsibility for the success or failure of a pupil's work.

Also, teacher's support in learning, continuous monitoring of pupils progress, and development of a pedagogical atmosphere in the classroom can lead to positive changes, namely, to the decline in avoidance strategies, development of a positive attitude towards mathematics and achieving higher levels of mathematical knowledge and skills. That implicates the development of didactic-methodical, pedagogical,

socio-emotional, and other teacher competencies.

Acknowledgements

The authors would like to thank the respondents who participated in the research. This study was supported by the Ministry of Science, Technological Development and Innovations of the Republic of Serbia (Contract No. 451-03-66/2024-03).

Conflict of interests

The authors declare no conflict of interest.

Author Contributions

Conceptualization, D.M., B.S. and N.T.; data curation, D.M. and N.T.; methodology, D.M. and B.S.; resources, D.M., N.T. and B.S.; formal analysis, D.M., N.T. and B.S.; D.M., N.T. and B.S.; validation, D.M., N.T. and B.S.; writing—original draft preparation, D.M., N.T. and B.S.; writing—review and editing, D.M., N.T. and B.S. All authors have read and agreed to the published version of the manuscript.

References

Akilli, M., & Genç, M. (2017). Modelling the effects of selected affective factors on learning strategies and classroom activities in science education. *Journal of Baltic Science Education*, *16*(4), 599-611. http://dx.doi.org/10.33225/jbse/17.16.599

Akin, A., Abaci, R., & Akin, Ü. (2011). Self-handicapping: A conceptual analysis. *Journal of Educational Sciences*, *3*(3), 1155-1168.

Antonijević, R. (2012). Contextual factors of the students' achievements in the area of mathematics. *Inovacije u nastavi-časopis za savremenu nastavu* [Innovations in teaching- Journal of Contemporary Teaching], *25*(3), 5-14.

Baran, M. (2019). Identifying barriers when teaching science and mathematics in low economy regions: swansea and hakkari as case studies. *Journal of Baltic Science Education*, *18*(6), 848-865. https://doi.org/10.33225/jbse/19.18.848

Cēdere, D., Jurgena, I., & Targamadze, V. (2018). Interest of latvian and lithuanian students in science and mathematics. *Journal of Baltic Science Education*, *17*(1), 31-42. https://dx.doi.org/10.33225/jbse/18.17.31

Cēdere, D., Jurgena, I., Helmane, I., Tiltiņa-Kapele, I., & Praulīte, G. (2015). Cognitive interest: problems and solutions in the acquisition of science and mathematics in schools of Latvia. *Journal of Baltic Science Education*, *14*(4), 424-434. https://bit.ly/3fGR3sZ

Davadas, S. D., & Lay, Y. F. (2017). Factors affecting students' attitude toward mathematics: A structural equation modeling approach. *Eurasia Journal of Mathematics, Science and Technology Education*, *14*(1), 517-529. https://doi.org/10.12973/ejmste/80356

Dewanti, S. S., Kartowagiran, B., & Jailani, R. (2020). Lecturers' experience in assessing 21st-century mathematics competency in Indonesia. *Problems of Education in the 21st Century*, *78*(4), 500-515. https://doi.org/10.33225/pec/20.78.500

Di Leo, I., Muis, K. R., Singh, C. A., & Psaradellis, C. (2019). Curiosity… Confusion? Frustration! The role and sequencing of emotions during mathematics problem solving. Contemporary educational psychology, *58*, 121-137. https://doi.org/10.1016/j.cedpsych.2019.03.001

Fokkens-Bruinsma, M., Van Rooij, E. C. M., & Canrinus, E. T. (2020). Perceived classroom goal structures as predictors of students' personal goals. *Teachers and Teaching*, *26*(1), 88-102. https://doi.org/10.1080/13540602.2020.1740195

Gadbois, S. A., & Sturgeon, R. D. (2011). Academic self-handicapping: Relationships with learning specific and general self-perceptions and academic performance over time. *British Journal of Educational Psychology*, *81*(2), 207-222. https://doi.org/10.1348/000709910X522186

Geary, D. C. (2011). Consequences, characteristics, and causes of mathematical learning disabilities and persistent low achievement in mathematics. *Journal of Developmental & Behavioral Pediatrics*, *32*(3), 250-263. https://doi.org/10.1097/dbp.0b013e318209edef

Goldin, G. A. (2010). Problem solving heuristics, affect, and discrete mathematics: A representational discussion. In G. Kaiser, & A. Sriraman (Eds.), *Theories of Mathematics Education* (pp. 241-250). Springer. http://dx.doi.org/10.1007/978-3-642-00742-2_24

Klinger, C.M. (2011). 'Connectivism': A new paradigm for the mathematics anxiety challenge? *Adult Learning Mathematics: An international journal*, *6*(1), 7-19. https://files.eric.ed.gov/fulltext/EJ1068259.pdf

Midgley, C., Kaplan, A., & Middleton, M. (2001). Performance-approach goals: Good for what, for whom, under what circumstances, and at what cost? *Journal of Educational Psychology*, *93*(1), 77-86. https://psycnet.apa.org/doi/10.1037/0022-0663.93.1.77

Munawaroh, N. (2017). The influence of teaching methods and learning environment to the student's learning achievement

of craft and entrepreneurship subjects at vocational high school. *International Journal of Environmental & Science Education*, *12*(4), 665-678.

Pan, S. C., Sana, F., Samani, J., Cooke, J., & Kim, J. A. (2020). Learning from errors: Students' and instructors' practices, attitudes, and beliefs. *Memory*, *28*(9), 1105-1122. https://doi.org/10.1080/09658211.2020.1815790

Pavlović-Babić, D., & Baucal, A. (2012). *Podrži me, inspiriši me. PISA 2012 u Srbiji: Prvi rezultati* [Support me, inspire me. PISA 2012 in Serbia: First results]. Institute of Psychology, Faculty of Philosophy, Center for Applied Psychology. https://bit.ly/3zS5LWy

Peeters, A., Robinson, V., & Rubie-Davies, C. (2020). Theories in use that explain adolescent help seeking and avoidance in mathematics. *Journal of Educational Psychology, 112*(3), 533-550. https://doi.org/10.1037/edu0000423

Ramirez, G., Hooper, S.Y., Kersting, N.B., Ferguson, R., & Yeager.D. (2018). Teacher math anxiety relates to adolescent students' math achievement. *AERA open*, *4*(1), 1–13. https://doi.org/10.1177/2332858418756052

Ryan, A. M., Gheen, M. H., & Midgley, C. (1998). Why do some students avoid asking for help? An examination of the interplay among students' academic efficacy, teachers' social–emotional role, and the classroom goal structure. *Journal of Educational Psychology*, *90*(3), 1-8. https://psycnet.apa.org/doi/10.1037/0022-0663.90.3.528

Schenke, K., Lam, A. C., Conley, A. M., & Karabenick, S. A. (2015). Adolescents' help seeking in mathematics classrooms: Relations between achievement and perceived classroom environmental influences over one school year. *Contemporary Educational Psychology*, *41*, 133-146. https://doi.org/10.1016/j.cedpsych.2015.01.003

Schwinger, M., Wirthwein, L., Lemmer, G., & Steinmayr, R. (2014). Academic self-handicapping and achievement: A meta-analysis. *Journal of Educational Psychology*, *106*(3), 744-761. http://dx.doi.org/10.1037/a0035832

Simonović, N. (2021). Teachers' key competencies for innovative teaching. International Journal of Cognitive *Research in Science, Engineering and Education (IJCRSEE)*, *9*(3), 331-345. https://doi.org/10.23947/2334-8496-2021-9-3-331-345

Teppo, M., Soobard, R., & Rannikmäe, M. (2021). Grade 6 & 9 student and teacher perceptions of teaching and learning approaches in relation to student perceived interest/enjoyment towards science learning. *Journal of Baltic Science Education*, *20*(1), 119-133. https://doi.org/10.33225/jbse/21.20.119

Turner, J. C., Midgley, C., Meyer, D. K., Gheen, M., Anderman, E. M., Kang, Y., & Patrick, H. (2002). The classroom environment and students' reports of avoidance strategies in mathematics: A multimethod study. *Journal of Educational Psychology*, *94*(1), 88-106. https://doi.org/10.1037/0022-0663.94.1.88

Uçar, F. M., & Sungur, S. (2017). The role of perceived classroom goal structures, self-efficacy, and engagement in student science achievement. *Research in Science & Technological Education*, *35*(2), 149-168. https://doi.org/10.1080/02635143.2017.1278684

Uysal, S. (2015). Factors affecting the mathematics achievement of Turkish students in PISA 2012. *Educational Research and Reviews*, *10*(12), 1670-1678. https://doi.org/10.5897/ERR2014.2067

Videnović, M., & Čaprić, G. (2020). *Pisa 2018: Izveštaj za Republiku Srbiju* [Pisa 2018: Report for the Republic of Serbia]. Ministry of Education, Science and Technological Development of the Republic of Serbia. https://ceo.edu.rs/wp-content/uploads/2022/11/PISA-izvestaj-2018.pdf

Vidić, T. (2021). Students' school satisfaction: The role of classroom climate, self-efficacy, and engagement. *International Journal of Cognitive Research in Science, Engineering and Education (IJCRSEE)*, *9*(3), 347-357. https://doi.org/10.23947/2334-8496-2021-9-3-347-357

Vujačić, M. B., Đević, R. S., & Jošić, S. M. (2020). School climate as factor of educational effectiveness of schools: Secondary data analysis from TIMSS 2015 study. *Inovacije u nastavi- časopis za savremenu nastavu* [Innovations in teaching-Journal of Contemporary Teaching], *33*(2), 15-28. http://dx.doi.org/10.5937/inovacije2002015V

Wang, L. (2021). The analysis of mathematics academic burden for primary school students based on PISA data analysis. *Frontiers in Psychology*, *12*, 229. https://doi.org/10.3389/fpsyg.2021.600348

Willis, J. (2010). *Learning to love math: Teaching strategies that change student attitudes and get results*. ASCD.